



Self-confidence and affect responses to short-term sprint interval training

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ABSTRACT

The study aimed to investigate the effects of repeated sprint (RS) training on somatic anxiety (SA), cognitive anxiety (CA), self-confidence (SC), rating of perceived exertion (RPE) and repeated sprint ability (RSA) indicators in elite young soccer players.

Thirty elite soccer players in the first football league (age: 17.8 ± 0.9 years) volunteered to participate in this study. They were randomly assigned to one of two groups: a repeated sprint training group (RST-G; $n = 15$) and a control group (CON-G; $n = 15$). RST-G participated in 6 weeks of intensive training based on RS ($6 \times (20 + 20$ m) runs, with 20 s passive recovery interval between sprints, 3 times/week). Before and after the 6-week intervention, all participants performed a RSA test and completed a Competitive Scale Anxiety Inventory (CSAI-2) and the RPE. After training RST-G showed a very significant ($p < 0.000$) increase in RSA total time performance relative to controls. Despite the faster sprint pace, the RPE also decreased significantly ($p < 0.005$) in RST-G, and their self confidence was significantly greater ($p < 0.01$), while the cognitive ($p < 0.01$) and somatic ($p < 0.000$) components of their anxiety state decreased. When practiced regularly, short bouts of sprint exercises improve anaerobic performance associated with a reduction in anxiety state and an increase in SC which may probably boost competitive performance.

1. Introduction

Identifying performance factors in soccer is a complex process. It has been pointed out that soccer complexity is reflected in a great difficulty to combine different performance factors: technical, tactical, physical and psychological [1,2]. Psychological factors constitute an inherent part of performance identifying variables [3]. In this context, they must be subject to a scheduled program which is interdependent with other tactical, technical and physical components [4].

In the present study, we are interested to some of these psychological factors: anxiety and self-confidence (SC). It has been demonstrated that these two factors are linked with performance in various sports disciplines [5–7]. These emotional states stem from athletes' interpretation of their competence level and the task difficulty [8]. In fact, athletes are anxious for many reasons, such as the importance of sporting success, or the difference between their abilities and skills needed for their sport. This anxiety can have "somatic", i.e., bodily (e.g. accelerated heart rate or hyperventilation, extreme muscle tension, stomach ache...) and "cognitive" consequences (e.g. concentration or attention difficulties, negative thoughts...) that can have a negative

impact on performance [9]. Conversely, SC can be of paramount importance for athletes, as their perception of being fit enough to meet the demands of the situation can have a positive impact on their performance [10].

On the other hand, it has been highlighted that soccer is an intermittent type team characterized by repeated explosive force efforts [2,11,12]. As a result, fatigue appears to be an important element in players' performance, as it is crucial in the degradation of tactical aspects, clear-headedness throughout technical gestures, speed-effort qualities, decision-making, attention and concentration [13]. Fatigue is also the response of metabolic and physiological adaptation to exhaustion effort. It resulted in an increase in hydrogen ions, lactate, inorganic phosphate, ammonia, and ADP; and a decrease in ATP, phospho-Creatine, and pH in active muscle cells during intense or supramaximal exercise [14]. Furthermore, anaerobic training, inducing fatigue, has well-established effects on anxiety that are comparable to other empirically-supported treatments [15]. This type of training may be relevant for training in team sports as it can induce small to large improvements in power, speed, repeated-sprint ability and endurance [16].

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Some authors add a psychological dimension by stressing that fatigue is associated with an increase in effort as perceived by athletes [17]. The most renowned method for combating fatigue at an early stage is to consider the evolution of effort perception during training [18]. Therefore, many athletes and coaches agree that it is important to systematically note the nature of their efforts and comment on their sensations [19]. Using The Borg RPE Scale [20] or subjective measures of exercise intensity is highly recommended. The perception of fatigue is a psychological perception indicator of the physiological state of fatigue [21], it is affected by multiple sources that can be categorized according to their origin whether physiological, psychological or external [22]. Several studies relate fatigue perception to psychological parameters in athletes. Masters & Ogles [23] demonstrated that cognitive dissociation strategies can alter fatigue perception. Boucher & Trenke [24] reported that perceptions of effort and fatigue decrease with the presence of music and tend to increase with cognitive effort [25] and vary in line with the general mood [26]. In addition, Noakes [21] concluded that motivation is a central psychological factor in fatigue perception. Petruzzello et al. [27] demonstrated minimal to moderate effects of acute and chronic physical activity on both anxiety state and trait in sedentary and active individuals.

Likewise, it has been reported that moderate and intense exercises generally reduce the anxiety state and the emotionally responses to charged pictures [28]. Steptoe et al. [29] found that 20-min of exercise duration at 50% or 70% of maximal oxygen intake reduce the stress of mental arithmetic in both athletes and inactive men.

Because of the high demand of repetitive high-intensity running and sprinting in soccer [30], repeated sprints (RS) have been used as the main training method to improve RSA. The beneficial effects of RS training interventions on physiological parameters have been widely studied [31,32]. To our best knowledge, no previous study has been interested to the effect of this type of training on emotion parameters such as anxiety and self-confidence.

Therefore, the aim of the current study was to investigate whether 6-week RS training 3 times a week would have positive effects on psychological parameters (e.g., anxiety, self confidence and RPE) and physiological (RSA) indicators in elite soccer players competing in the first football league. It was hypothesized that RS training would improve performance indicators in comparison with regular training. Furthermore, it was hypothesized that this training-induced performance improvement would occur without inducing unnecessary and undesirable anxiety state.

2. Materials and methods

2.1. Participants

Thirty elite soccer players (age: 17.8 ± 0.9 years; height: 1.78 ± 0.05 m; body mass: 70.1 ± 6.6 kg, BMI: 22.5 ± 1.8 kg/m²) were recruited from a professional soccer team. They are competing in the first football league with good competition level. All participants reviewed and signed consent forms approved by the local Ethics Committee for Human Research in accordance with ethical standards of Helsinki Declaration. They were engaged in 90 min sessions of standard sport-specific training 3 times per week. These sessions comprised technical and tactical skill development (80% of the total time) as well as aerobic and anaerobic training. Participants were randomly assigned to one of two groups, a RS training group (RST-G; $n = 15$) and a control group (CON-G; $n = 15$) underwating just the standard training. None of the participants reported any current neuromuscular diseases or musculoskeletal injuries and none were taking any dietary or performance-enhancing supplements that might have affected their performance.

2.2. Experimental design

Field tests were carried out on third-generation synthetic soccer turf, at the same time of day (between 5 p.m. and 7 p.m.) and under similar environmental conditions (temperature: 18–22 °C, humidity: 50–60%, Wind speed: ≤ 2 m/s). All participants were encouraged to maximum effort throughout. One week before the commencement of the study, 2 orientation sessions were held in order that participants become familiar with the general environment, equipment, and experimental procedures, and to minimize subsequent learning effects. Both subject groups were tested for all variables before and after the 6-week intervention. Evaluations included the Competitive State Anxiety Inventory-2 (CSAI-2), the RSA and the RPE tests. The CSAI-2 was completed at rest, two and a half hours before the RSA-test [33]. Then all participants performed a standardized 15-min warm-up (sub maximal running, dynamic stretching; low intensity forward, sideways, and backward running; several acceleration runs; and jumping at a progressively increased intensity (60% of VO_{2max}). After 5 min of seated rest, they carried out the RSA test consisting of $6 \times (20 + 20$ m) runs, with 20 s passive recovery intervals between sprints [34]. Following 30 min recovery, the RPE of the RSA test was evaluated. After baseline testing, the RST-G underwent a 6-week intervention, performing 3 sessions per week of RS training on non-consecutive days, as a part of their overall training regimen; however, the CON-G maintain the standard training.

2.3. Anxiety and self confidence assessment

Before and after the intervention, all participants used CSAI-2 [10] to rate responses over the multidimensional constructs of cognitive anxiety (CA), somatic anxiety (SA), and SC, using a total of 23 items (7 for CA, 7 for SA, and 9 for SC) [35]. In this study, Boudhiba et al. [35] version of the CSAI-2, already validated in our population, was used. Symptom intensity levels were rated on a 4-point Likert scale ranging from 1 ('not at all') to 4 ('very much so'). A high score on SC scale implied confidence in one's ability to deal with the competitive situation in question. A high score on SA scale reflected the perception of many vegetative reactions to this challenge, and a high score on CA scale indicated difficulties in concentration and negative concerns about performance.

2.4. Repeated sprint ability (RSA) assessment

Subjects performed an initial warm up (10 min of jogging at 50–60% of maximum heart rate (HR_{max})), followed by five sprints over short distances (10 and 15 m) and 5 min of stretching). After 5 min of seated rest, a RSA test was carried out consisting of $6 \times (20 + 20$ -m) runs with 20 s of passive jog recover between sprints [34]. Participants were allowed 10 m to decelerate following each sprint and rested on the start line for approximately 5 s before starting the next sprint. Sprints began at the signal. From a standing start, subjects covered the required distance at their maximum speed. A demonstration was made to ensure the test procedure was well understood. The time taken for each sprint was recorded by photocells (Microgate, Bolzano, Italy). The data recorded were: the $RSA_{best\ time}$ (s) (the quickest sprinting time), the $RSA_{total\ time}$ (s) (the sum of the 6 sprint times) and the $RSA_{decrement}$ (%): The degree of fatigue experienced by athletes during the RSA test, was calculated using the equation proposed by Fitzsimons et al. [36]. Participants were instructed to produce maximal efforts for every sprint and not to pace themselves. The observer called out each person's performance immediately after completing each run.

2.5. Rating of perceived exertion (RPE) assessment

The 10-point version of Borg's RPE test was used [37]. Subjects were asked to define the perceived effort of the RSA test by a single number

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